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Admitted in Virginia and  
the District of Columbia

March 11, 2013

Michelle Kerr  
Remedial Project Manager  
Superfund Division  
U.S. Environmental Protection Agency  
Region 5  
77 West Jackson Blvd.  
Chicago, Ill 60604-3590

Re: Chemetco Superfund Site

Dear Ms. Kerr:

Enclosed please find the responses of Warrenton Copper LLC to EPA's request for information pursuant to CERCLA § 104(e) regarding the Chemetco Superfund Site. We apologize for any inconvenience WC's delay in submitting this response may have caused the Agency. As noted in my letter to you dated October 12, 2012, that delay was primarily due to the fact that WC went out of business in December 2008, after which most of its records were destroyed.

Please let me know if EPA has any questions regarding the enclosed responses.

Sincerely,

A handwritten signature in black ink, appearing to read "Tom Bick".

Thomas K. Bick  
Counsel for WCI

Enclosure

Cc w/out Enclosure:

Thomas Martin (by email: martin.thomas@epa.gov)

**RESPONSE OF WARRENTON COPPER LLC TO INFORMATION REQUEST  
OF THE U.S. ENVIRONMENTAL PROTECTION AGENCY  
—CHEMETCO SUPERFUND SITE, HARTFORD, ILLINOIS**

Warrenton Copper LLC ("WC") submits the following responses to the request for information of the U.S. Environmental Protection Agency pursuant to § 104(e) of the Comprehensive Environmental Response Compensation and Liability Act (CERCLA). WC is continuing its search for the requested information and reserves its right to supplement or otherwise revise these responses as additional information may become available. For ease of reference, the following responses follow the information request, which is in bold type.

1. **Provide the following information about your company ("Respondent"):**
  - (a) **The complete and correct legal name of your company.**
  - (b) **The name(s) and address(es) of the President and the Chairman of the Board, or other presiding officer of the company.**
  - (c) **The state of incorporation of the company and the company's agents for service.**
  - (d) **The name(s) of all subsidiaries, affiliates, or parent companies to your company.**
  - (e) **The state of incorporation and agents for service of process in the state of incorporation.**
  - (f) **The status of all subsidiaries, affiliates, or parent companies to your company.**

**RESPONSE**

- (a) Warrenton Copper LLC ("WC")
- (b) WC is now out of business and has no current officers or board members.
- (c) WC was formed as an LLC in Delaware on December 8, 1999. Its registered office is the Corporation Trust Company, Corporation Trust Center, 1209 Orange Street, Wilmington, Delaware 19801. It remains a corporation in good standing.
- (d) On December 8, 1999, WC was incorporated by Warrenton Holding Corp., which also became WC's sole Member. WC remained wholly owned by Warrenton Holding Corp. from that date until August 30, 2004, when, as a result of a merger transaction, WC became wholly owned by American Iron & Metal (U.S.A.) Inc. WC has never had a subsidiary.

(e) See response (c) above.

(f) American Iron & Metal (USA) Inc. is a privately owned corporation founded in 1988. It is incorporated in Delaware and headquartered in Cranston, Rhode Island.

**2. Describe and provide any documents related to your company's business activities which resulted in sending material to Chemetco.**

**RESPONSE:**

WC operated a secondary copper refinery in Warrenton, Missouri from early 2000 until December 19, 2008. The process involved various grades of copper to be refined by reverberatory furnaces and turned into ingots. The ingots were then sold to other manufacturers to produce various copper-based products, the most popular being copper wiring. As part of this process, WC also operated a shredding/chopping line for the purpose of processing mixed copper scrap to recover copper and aluminum. Some of the material received or processed by WC that was not used in manufacturing copper ingots was sent to the Chemetco plant in Hartford, Illinois ("Chemetco") for recycling.

WC has not located any documents related to the Company's business activities which resulted in sending material to Chemetco. The Company believes that any such documents were destroyed following the closing of the Warrenton plant in December 2008. The Company's search for such documents is continuing.

**3. Describe and provide any documents related to your company's role at the Site, including what duties/involvement your company had at the Site.**

**RESPONSE:**

WC sold material to Chemetco to be recycled at its Hartford, Illinois facility. WC had no other involvement with Chemetco.

**4. If the nature or size of Respondent's activities in relation to Chemetco changed over time, describe those changes and the dates they occurred.**

WC's activities related to Chemetco did not vary significantly over the two-year period (2000-2001) that such activities were undertaken.

**5. For each type of waste or material used in Respondent's operations, describe and provide documents relating to Respondent's contracts, agreements, or other arrangements for its disposal, treatment, trading, or recycling with Chemetco, including but not limited to whether Respondent controlled where waste sent to Chemetco warehouses was ultimately processed/recycled.**

RESPONSE:

There was no written agreement between WC and Chemetco. For each type of material sent by WC to Chemetco for recycling, WC shipped the material pursuant to an open purchase order after Chemetco had fixed a price for the material that was acceptable to WC. For the vast majority of that material, Chemetco set the price before it was shipped by WC. For a small percentage of the material, Chemetco first received the material from WC and then, following its analysis of that material, would negotiate the price with WC. Chemetco paid WC for the Copper No. 2 and Alloy 194. It is believed that the slag material that WC sent to Chemetco was usually accepted by Chemetco without payment to WC. WC never paid Chemetco to accept any the material. WC did not ship material to a Chemetco warehouse.

6. **If not already provided, specify the dates and circumstances when Respondent's waste or material was taken to the Site, and identify the companies or individuals who brought Respondent's waste/material to the Site. Provide any documents which support or memorialize your response.**

RESPONSE:

The only records of which WC is aware that are currently in existence are computerized records of transactions that took place in 2001 and reflect the pounds of material shipped to Chemetco. Although we are aware that WC sold similar material to Chemetco in 2000, we have not located records reflecting those transactions. We will send EPA printouts of the computerized records reflecting shipments in year 2001. WC hired independent carriers to transport the material to Chemetco. A variety of carriers were hired by WC for this purpose. However, WC has not retained records from which the identity of those independent carriers can be ascertained.

7. **Were transactions between your company and Chemetco and specifically the Site: (1) an outright sale; (2) subject to a written or verbal "tolling" agreement between the companies; or (3) reflected the "banking" of the transacted material in a metal account at the request of your company for return or other disposition at a later date?**

RESPONSE:

The transactions were outright sales only. In most cases, Chemetco paid WC for the material that was sent for recycling. On rare occasions, the material was sent without money changing hands. There was no tolling or banking arrangement.

8. **Did your company have any influence over waste disposal or recycling activities at the Site? If so, how?**

RESPONSE:

No.

9. **Was any shipment of material sent to the Site by Respondent ever refused and/or returned? If so, describe this event in detail, including its cause and outcome.**

Not to our knowledge.

10. **Describe in detail the types of material that you sent for recycling, processing, or disposal at the Site. In your response, please also give the generic name of each type of materials shipped to the Site [e.g., scrap metal (including scrap automobiles), batteries, electronics, scrap papers, scrap plastic or scrap textile, etc.].**

- (a) **Identify whether the materials were delivered directly to the Site or were trans-shipped there from another intermediate delivery point. If applicable, describe each such delivery point.**
- (b) **State whether any of the material was ever tested by your company and if so, whether the substances exhibited any of the characteristics of a hazardous waste identified in 35 Illinois Administrative Code 721, Subpart C or 40 C.F.R. § 261, Subpart C.**
- (c) **Describe what was done to materials once they were brought to the Site, including any further processing of the materials.**
- (d) **Provide any additional information and all documents that you believe are related to the type, nature and characteristics of the materials you sent to the Site.**
- (e) **List the years in which your company sent materials to Chemetco and/or its broker(s) for recycling, processing, or disposal.**

**RESPONSE:**

WC sent three basic types of material to Chemetco, as follows:

Copper # 2: This is commercial grade material which includes a number of unalloyed copper solids, at least 96% copper, which are free of excessive lead, tin, soldered copper scrap, brasses and bronzes, excessive oil, iron and non-metallics. Copper # 2 can be processed into useful products without waste generation.

Alloy 194: This is a commercial grade high-strength modified copper, which is alloyed with iron and deoxidized with phosphorus. It is known for its high strength and corrosion resistance. Alloy 194 can be processed into useful products without waste generation.

Broken Slag: This consists of a variety of copper-containing slag generated from copper smelting processes.

- (a) The above materials were delivered directly to Chemetco.
- (b) In all likelihood, WC did not test any of the materials that it arranged to ship to Chemetco.
- (c) It is believed that Chemetco recycled all of the material WC sent there, including the slag. It is also believed that in most cases Chemetco extracted metals, primarily copper, from the material sent by WC. It is not believed any waste requiring disposal was generated by Chemetco in the processing of this material.
- (d) Specifications for the material that WC sent to Chemetco in 2001 are shown in **Attachment \_\_\_\_** hereto.
- (e) 2000 and 2001.

### **Questions and Requests for Documents Related to Scrap Metal**

- 11. For the following questions which relate to transactions involving scrap metals, provide the requested information, and also provide copies of any documents that contain any information that is related to the response:**
- (a) **Did a market exist for the scrap metal listed in your response to question No. 10 above? If so, describe the nature of such a market at the time of the transaction (possible uses, possible consumers, etc.) and the source of the commercial specification grade (e.g., Institute of Scrap Recycling Industries, Inc. (ISRI), Department of Defense, or wherever your company would find the grade published).**
  - (b) **What commercial specification grade did the scrap metal listed in your response to question No. 10 meet? Identify/list the commercial specification grades that each scrap metal identified in No. 9 met.**
  - (c) **At the time of the transaction(s) what was the intended disposition of the scrap metal listed in your response to question No. 10? Did this include burning as fuel, or for energy recovery, or incineration?**
  - (d) **After sale, transfer, delivery, recycling, or disposal, what portion of the scrap metal listed in your response to question No. 10 was to be made available for use as a feedstock for manufacturing of new saleable products? Explain how the portion identified in this answer was derived or calculated.**
  - (e) **Could the scrap metal listed in your response to question No. 10 have been used as a replacement or substitute for a virgin raw material? If so, provide details.**

- (f) **Could any products made from the scrap metal listed in your response to question No. 10 have been used as a replacement or substitute for a product made, in whole or in part, from a virgin raw material? If so, provide details.**
- (g) **Did your company melt the scrap metal listed in your response to question No. 10 before it was transported/delivered to the Site? If yes, describe the process used for melting the scrap metal.**
- (h) **Describe the source of or the process that produced the materials sent to the Site.**

#### RESPONSE

- (a) A market existed for all of the material sent by WC to Chemetco, including the slag, at the time of the shipments.
  - (b) The specifications shown in Attachment a indicate the information available for the Copper #2 and Alloy 194. There were no specifications for the slag material.
  - (c) The intended disposition of the material sent was for recycling of the metals that could be extracted from the material. It is not believed that any of the material sent by WC was burned or incinerated by Chemetco.
  - (d) Unknown.
  - (e) 100% of the Copper #2 and Alloy 194 consisted of metals that could be recycled feedstock in the manufacture of saleable products.
  - (f) Yes, 100% of the Copper #2 and Alloy 194 could be so used.
  - (g) This is not known for sure. In rare instances, WC may have melted some of the material.
  - (h) Mostly industrial sources from various industries. The slag material was the produce of a copper refining process.
- 12. Did any of the scrap material sent to the Site contain other material(s) incident to or adhering to the scrap? If so, describe in detail.**

#### RESPONSE

No.

- 13. Did any of the material sent to the Site contain wire or wiring? If so, was the wire's insulation first stripped before being shipped to or accepted at the Site, after being received at the Site, or was the wire not stripped?**

RESPONSE:

No.

14. Did the material shipped include drums or shipping containers? If so, specify the generators of the drums or shipping containers, the capacity of such drums or containers and whether such containers ever contained liquid of any sort. If so, specify the type of liquid and whether such liquids contained wastes of any kind.

RESPONSE:

All of the material was shipped by WC to Chemetco in gaylord boxes.

15. Describe all efforts (i.e., Site visits) taken by your company to determine what would be done with the scrap metal identified in your response to question No. 10.

RESPONSE:

It is known whether any representative of WC visited Chemetco. All transactions were arranged telephonically.

**Questions and Request for Documents Related to Electrical and Electronic Equipment**

16. For the following questions which relate to transactions involving electrical and electronic equipment (e.g., transformers, capacitors, white goods, computers, monitors, cables, circuit boards, or other electrical equipment) provide the requested information, and also provide copies of any documents that contain any information that is related to the response:
- (a) List an estimated number of shipments of electrical and electronic equipment your company sent to the Site on an annual basis and list the years. In this list, include the type and quantity, volume and weight of electrical and electronic equipment sent;
  - (b) At the time of the transaction(s), what was the intended disposition of the electrical and electronic equipment listed in your response to question 15(a)? Did the intended disposition include burning as fuel or for energy recovery or incineration?

RESPONSE:

Not applicable.

17. With respect to waste or materials sent to the Site, at the time of the transactions, specify the measures you took to determine the actual means of treatment, disposal, recycling, or other uses of the material. Provide information you had and any



**documents relating to the treatment, recycling and disposal practices of Chemetco at the Site. What assurances, if any, were you given by the owner/operator of the Site regarding the proper handling and ultimate disposition of the materials you sent there, as well as its compliance with applicable environmental laws? Include in your response any correspondence to and from Chemetco relating to this topic and dates the measures were taken or assurances were given.**

RESPONSE:

WC had no control over the means of treatment, disposal, recycling or other uses of its material by Chemetco. Chemetco simply represented to WC that the material would be recycled.

- 18. What efforts and when, if any, did you take to investigate the nature of the operations conducted at the Site and the environmental compliance of the Site prior to selling, transferring, delivering, disposing of, trading, or arranging for the treatment, recycling, or disposal of any materials?**

RESPONSE:

No particular measures were taken by WC, which shipped material to Chemetco with the understanding that it would be safely recycled into useful products.

- 19. Provide all information in your possession that shows that you were in compliance with applicable federal environmental regulations or standards regarding the recycling of materials, particularly Section 127 of CERCLA, 42 U.S.C. § 9627, sent to the Chemetco Site.**

RESPONSE:

No such information has been located with respect to material sent to Chemetco.

- 20. Provide all information in your possession that shows that you were in compliance with applicable federal environmental regulations or standards regarding scrap metal promulgated under Resource Conservation and Recovery Act (RCRA).**

RESPONSE:

No such information has been located with respect to material sent to Chemetco.

- 21. Provide all RCRA Identification Numbers issued to Respondent by EPA or a state for Respondent's operations.**

RESPONSE:

We do not believe any such identification numbers were issued to WC with respect to material sent to Chemetco.

- 22. List all federal and state environmental laws and regulations under which Respondent has reported to federal or state governments, including but not limited to: Toxic Substances Control Act, 15 U.S.C. Sections 2601 *et seq.*, (TSCA); Emergency Planning and Community Right-to-Know Act, 42 U.S.C. Sections 1101 *et seq.*, (EPCRA); and the Clean Water Act (the Water Pollution Prevention and Control Act), 33 U.S.C. Sections 1251 *et seq.***

RESPONSE:

No such information has been located with respect to material sent to Chemetco.

- 23. Identify the federal and state offices to which such information was sent. State the years during which such information was sent/filed.**

RESPONSE:

No such information has been located with respect to material sent to Chemetco.

- 24. If you have reason to believe that there may be persons able to provide a more detailed or complete response to any question contained herein or who may be able to provide additional responsive documents, identify such persons and the additional information or documents that they may have.**

RESPONSE:

The following individuals may have additional information with respect to questions nos. 1, 4-15, and 18-23 above:

Stan Shanker, President of WC 2004-2006

Jim Devine, President of WC 2006-2007

Brian Young, President of WC 2008-closure

Osel Kerr

Terry Mahoney

Serge Thibault

- 25. If any of the documents solicited in this information request are no longer available, please indicate the reason why they are no longer available. For each and every questions contained herein, if information or documents responsive to this Information Request are not in your possession, custody or control, then identify the**

**persons from whom such information or documents may be obtained. If the records were destroyed, provide us with the following:**

- (a) The document retention policy between 1970 and 2001;**
- (b) A description of how the records were destroyed (burned, trashed, etc.) and the approximate date of destruction;**
- (c) A description of the type of information that would have been contained in the documents;**
- (d) The name, job title and most current address know by you of the person(s) who would have produced these documents, the person(s) who would have been responsible for the retention of these documents; the person(s) who would have been responsible for the destruction of these documents; and the person(s) who had and/or still may have the originals or copies of these documents; and**
- (e) The names and most current address of any person(s) who may possess documents relevant to this inquiry.**

**RESPONSE:**

- (a) WC did not have a document retention policy during the period indicated.
- (b) Most of the records would have been trashed in the period 1970 through 2008.
- (c) Primarily bills of lading, inventory records, and invoices.
- (d) Unknown.
- (e) Mathieu Germain and Osel Kerr. Both currently work at American Iron & Metal, American Iron and Metal Co., Inc., 9100 Henri-Bourassa Est, Montreal, Quebec, Canada H1E 2S4

**26. Please state the name, title and address of each individual who assisted or was consulted in the preparation of the response to this information request.**

**RESPONSE:**

Mathieu Germain

Thomas Bick

Osel Kerr

Terry Mahoney

Serge Thibault

All of the above except Thomas Bick work at the American Iron and Mineral address noted in response 25(e) above. Mr. Mahoney formerly worked at WC. Mr. Bick's contact information is:

Thomas K. Bick  
1747 Pennsylvania Avenue NW  
Suite 300  
Washington, D.C. 20006



WARRENTON

CHEMETCO

Inventory Card Cust 52 warrenton

TACODE	TAREFE	TANOSQ	TAFIL1	TADATE	TADIVI	TAPCOD	TAPGRD	TAPDS	TAPRX	TAMNT
CV	40220	111803		240901	WN	2020	CU 2 TUYERRS	(42,792)	\$ 0.54	\$ (24,040.55)
CV	40221	111805		240901	WN	2020	CU 2 TUYERRS	(17,860)	\$ 0.54	\$ (10,033.75)
CV	40217	111777		200901	WN	2023	ALLOY 194	(45,044)	\$ 0.56	\$ (25,485.90)
CV	40216	111778		200901	WN	2023	ALLOY 194	(45,724)	\$ 0.56	\$ (25,870.64)
CV	40219	111779		200901	WN	2023	ALLOY 194	(44,624)	\$ 0.56	\$ (25,248.26)
CV	40221	111804		240901	WN	2023	ALLOY 194	(26,232)	\$ 0.56	\$ (14,784.36)
CV	40151	108692		150301	WN	2093	BROKEN SLAG	(45,298)	\$ 0.09	\$ (9,920.26)
CV	40152	108693		150301	WN	2093	BROKEN SLAG	(46,090)	\$ 0.09	\$ (10,093.71)
CV	40154	108704		150301	WN	2093	BROKEN SLAG	(46,120)	\$ 0.09	\$ (10,100.28)
CV	40155	108705		150301	WN	2093	BROKEN SLAG	(46,774)	\$ 0.09	\$ (10,243.51)
CV	40157	108706		150301	WN	2093	BROKEN SLAG	(44,826)	\$ 0.09	\$ (9,816.89)
CV	40162	108959		270301	WN	2093	BROKEN SLAG	(43,900)	\$ 0.09	\$ (9,614.10)
CV	40167	109066		290301	WN	2093	BROKEN SLAG	(45,076)	\$ 0.09	\$ (9,871.64)
CV	40169	109068		290301	WN	2093	BROKEN SLAG	(45,554)	\$ 0.09	\$ (9,976.33)
CV	40171	109178		310301	WN	2093	BROKEN SLAG	(47,770)	\$ 0.09	\$ (10,461.63)
CV	40172	109179		310301	WN	2093	BROKEN SLAG	(6,267)	\$ 0.09	\$ (1,372.47)
CV	40172	109180		310301	WN	2093	BROKEN SLAG	(39,471)	\$ 0.09	\$ (8,644.15)
CV	40173	109181		310301	WN	2093	BROKEN SLAG	(46,288)	\$ 0.09	\$ (10,137.07)
CV	40163	109182		310301	WN	2093	BROKEN SLAG	(36,433)	\$ 0.09	\$ (7,978.83)
CV	40177	109346		120401	WN	2093	BROKEN SLAG	(44,224)	\$ 0.09	\$ (9,685.06)
CV	40179	109416		120401	WN	2093	BROKEN SLAG	(45,654)	\$ 0.09	\$ (9,998.23)
CV	40180	109417		120401	WN	2093	BROKEN SLAG	(45,712)	\$ 0.09	\$ (10,010.93)
CV	40178	109418		120401	WN	2093	BROKEN SLAG	(46,506)	\$ 0.09	\$ (10,184.81)
CV	40183	109654		200401	WN	2093	BROKEN SLAG	(45,202)	\$ 0.09	\$ (9,894.72)
CV	40185	109655		200401	WN	2093	BROKEN SLAG	(44,538)	\$ 0.09	\$ (9,749.37)
CV	40182	109832		300401	WN	2093	BROKEN SLAG	(32,145)	\$ 0.09	\$ (7,039.76)
CV	40182	109833		300401	WN	2093	BROKEN SLAG	(14,211)	\$ 0.09	\$ (3,112.21)
CV	40187	109834		300401	WN	2093	BROKEN SLAG	(45,676)	\$ 0.09	\$ (10,003.04)
CV	40188	109923		300401	WN	2093	BROKEN SLAG	(44,032)	\$ 0.09	\$ (9,643.01)
CV	40190	110102		140501	WN	2093	BROKEN SLAG	(45,962)	\$ 0.09	\$ (10,065.68)
CV	40191	110103		140501	WN	2093	BROKEN SLAG	(379)	\$ 0.09	\$ (83.00)
CV	40191	110104		140501	WN	2093	BROKEN SLAG	(43,093)	\$ 0.09	\$ (9,437.37)
CV	0	110115		140501	WN	2093	BROKEN SLAG	43,900	\$ 0.09	\$ 9,614.10
CV	0	110116		140501	WN	2093	BROKEN SLAG	36,433	\$ 0.09	\$ 7,978.83
CV	40192	110120		140501	WN	2093	BROKEN SLAG	(43,268)	\$ 0.09	\$ (9,475.69)
CV	40194	110250		180501	WN	2093	BROKEN SLAG	(37,065)	\$ 0.09	\$ (8,117.24)
CV	40194	110251		180501	WN	2093	BROKEN SLAG	(7,161)	\$ 0.09	\$ (1,568.26)
CV	40196	110561		310501	WN	2093	BROKEN SLAG	(44,302)	\$ 0.09	\$ (9,702.14)
CV	40197	110611		70601	WN	2093	BROKEN SLAG	(45,594)	\$ 0.09	\$ (9,985.09)
CV	40199	110615		70601	WN	2093	BROKEN SLAG	(44,284)	\$ 0.09	\$ (9,698.20)
CV	40201	110728		180601	WN	2093	BROKEN SLAG	(47,384)	\$ 0.09	\$ (10,377.10)
CV	40202	110731		180601	WN	2093	BROKEN SLAG	(8,182)	\$ 0.09	\$ (1,791.86)
CV	40202	110732		180601	WN	2093	BROKEN SLAG	(35,276)	\$ 0.09	\$ (7,725.44)
CV	40204	110858		270601	WN	2093	BROKEN SLAG	(44,318)	\$ 0.09	\$ (9,705.64)
CV	40205	111058		300601	WN	2093	BROKEN SLAG	(42,638)	\$ 0.09	\$ (9,337.72)
CV	40208	111209		180701	WN	2093	BROKEN SLAG	(45,562)	\$ 0.09	\$ (9,978.08)
CV	40209	111219		200701	WN	2093	BROKEN SLAG	(43,540)	\$ 0.09	\$ (9,535.26)
CV	40211	111456		310701	WN	2093	BROKEN SLAG	(42,260)	\$ 0.09	\$ (9,254.94)
CV	40212	111553		60801	WN	2093	BROKEN SLAG	(33,586)	\$ 0.09	\$ (7,355.33)
CV	75093	144734		160305	WN	92050	BROKERAGE CU TURNING	(30,672)	\$ 1.22	\$ (36,423.00)
CV	75093	144735		160305	WN	92050	BROKERAGE CU TURNING	(7,630)	\$ 1.22	\$ (9,060.63)
CV	75094	144736		160305	WN	92050	BROKERAGE CU TURNING	(3,224)	\$ 1.22	\$ (3,828.50)
CV	75094	144737		160305	WN	92050	BROKERAGE CU TURNING	(30,113)	\$ 1.22	\$ (35,759.19)
CV	1147	150717		310305	WN	92050	BROKERAGE CU TURNING	30,672	\$ 1.22	\$ 36,423.00
CV	1147	150718		310305	WN	92050	BROKERAGE CU TURNING	7,630	\$ 1.22	\$ 9,060.63
CV	1147	150719		310305	WN	92050	BROKERAGE CU TURNING	3,224	\$ 1.22	\$ 3,828.50
CV	1147	150720		310305	WN	92050	BROKERAGE CU TURNING	30,113	\$ 1.22	\$ 35,759.19

(1,743,564)

\$ (458,616.58)





Designation: B 465 – 04

## Standard Specification for Copper-Iron Alloy Plate, Sheet, Strip, and Rolled Bar<sup>1</sup>

This standard is issued under the fixed designation B 465; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

*This standard has been approved for use by agencies of the Department of Defense.*

### 1. Scope\*

1.1 This specification establishes Copper Alloy UNS Nos. C19200, C19210, C19400, C19500, C19700, and C19720 plate, sheet, strip, and rolled bar.

1.2 The values stated in inch-pound units are to be regarded as the standard.

### 2. Referenced Documents

#### 2.1 ASTM Standards:<sup>2</sup>

B 193 Test Method for Resistivity of Electrical Conductor Materials

B 248 Specification for General Requirements for Wrought Copper and Copper-Alloy Plate, Sheet, Strip, and Rolled Bar

B 601 Classification for Temper Designations for Copper and Copper Alloys—Wrought and Cast

B 846 Terminology for Copper and Copper Alloys

E 8 Test Methods for Tension Testing of Metallic Materials

E 54 Test Methods for Chemical Analysis of Special Brasses and Bronzes<sup>3</sup>

E 62 Test Methods for Chemical Analysis of Copper and Copper Alloys (Photometric Methods)

E 75 Test Methods for Chemical Analysis of Copper-Nickel and Copper-Nickel-Zinc Alloys

E 76 Test Methods for Chemical Analysis of Nickel-Copper Alloys

E 112 Test Methods for Determining Average Grain Size

E 478 Test Methods for Chemical Analysis of Copper Alloys

E 527 Practice for Numbering Metals and Alloys (UNS)

### 3. General Requirements

3.1 The following sections of Specification B 248 constitutes a part of this specification:

- 3.1.1 Terminology,
- 3.1.2 Materials and Manufacture,
- 3.1.3 Workmanship, Finish, and Appearance,
- 3.1.4 Sampling,
- 3.1.5 Number of Tests and Retests,
- 3.1.6 Specimen Preparation,
- 3.1.7 Test Methods (except chemical analysis),
- 3.1.8 Significance of Numerical Limits,
- 3.1.9 Inspection,
- 3.1.10 Rejection and Rehearing,
- 3.1.11 Certification,
- 3.1.12 Test Reports (Mill),
- 3.1.13 Packaging and Package Marking, and
- 3.1.14 Supplementary Requirements.

3.2 In addition, when a section with a title identical to that referenced in 3.1 appears in this specification, it contains additional requirements which supplement those appearing in Specification B 248.

### 4. Terminology

4.1 *Definitions*—For definitions of terms related to copper and copper alloys, refer to Terminology B 846.

### 5. Ordering Information

5.1 Contracts or purchase orders for product under this specification should include the following information:

5.1.1 ASTM designation and year of issue (for example B 465–XX),

5.1.2 Copper Alloy UNS No. designation (for example, C19200),

5.1.3 Temper (Section 8),

5.1.4 *Dimensions*—Thickness, width, length, and so forth (Section 13),

5.1.5 *Form*—Plate, sheet, strip, or rolled bar,

5.1.6 *How Furnished*—Coils (rolls), specific lengths or stock lengths, with or without ends,

5.1.7 *Quantity*—total weight each form, temper, and size, and

5.1.8 When material is purchased for agencies of the U.S. government (Section 12).

5.2 The following options are available under this specification and should be specified in the contract or purchase order when required:

<sup>1</sup> This specification is under the jurisdiction of ASTM Committee B05 on Copper and Copper Alloys and is the direct responsibility of Subcommittee B05.01 on Plate, Sheet, and Strip.

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<sup>2</sup> For referenced ASTM standards, visit the ASTM website, [www.astm.org](http://www.astm.org), or contact ASTM Customer Service at [service@astm.org](mailto:service@astm.org). For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

<sup>3</sup> Withdrawn.

\*A Summary of Changes section appears at the end of this standard.



5.2.1 *Type of Edge*—Slit, sheared, sawed, square corners, round corners, rounded edges, or full rounded edges,

5.2.2 Width and straightness tolerances (appropriate table in Specification B 248),

5.2.3 Heat identification or traceability details,

5.2.4 Certification, and

5.2.5 Mill test report.

## 6. Materials and Manufacture

### 6.1 *Material:*

6.1.1 The material of manufacture shall be a cast bar, cake, slab, and so forth of Copper Alloy UNS No. C19200, C19210, C19400, C19500, C19700, or C19720 as specified in the ordering information, and of such purity and soundness as to be suitable for processing into the products prescribed herein.

6.1.2 In the event heat identification or traceability is required, the purchaser shall specify the details desired.

NOTE 1—Because of the discontinuous nature of the processing of castings into wrought products, it is not practical to identify a specific casting analysis with a specific quantity of finished product.

### 6.2 *Manufacture:*

6.2.1 The product shall be manufactured by such hot-working, cold-working, and annealing processes as to produce a uniform wrought structure in the finished product.

6.2.2 The product shall be hot- or cold-worked to the finished size, and subsequently annealed, when required, to meet the temper properties specified.

6.2.3 *Edges*—Slit edges shall be furnished unless otherwise specified in the contract or purchase order.

## 7. Chemical Composition

7.1 The material shall conform to the requirements prescribed in Table 1 for the Copper Alloy UNS No. designation specified in the ordering information.

7.1.1 These composition limits do not preclude the presence of other elements. Limits may be established and analysis required for unnamed elements by agreement between the manufacturer and the purchaser.

7.2 Copper, when specified as the remainder, may be taken as the difference between the sum of results for specified elements and 100 %.

7.3 When all elements listed in Table 1 for the designated alloy are determined, the sum of results shall be 99.8 % minimum.

## 8. Temper

8.1 As defined in Classification B 601, products shall be produced in tempers O60 (soft annealed), O61 (annealed), O50 (light annealed), O82 (annealed to temper - ½ hard), H01 (¼ hard), H02 (½ hard), H03 (¾ hard), H04 (hard), H06 (extra hard), HR02 (½ hard), HR04 (hard), H08 (spring), H10 (extra spring), and H14 (super spring).

NOTE 2—The purchaser should confer with the manufacturer or supplier for the availability of product in a specific alloy, temper, and form, since all tempers are subject to manufacturing limitations.

NOTE 3—Properties of special tempers not listed in this specification are subject to agreement between the manufacturer and purchaser.

## 9. Grain Size for Annealed Tempers

9.1 *Grain Size*—No grain size requirements have been established for tempers O50, O60, and O61; however, the product material shall be fully recrystallized when examined in accordance with Test Methods E 112.

## 10. Physical Property Requirements

### 10.1 *Electrical Resistivity Requirement:*

10.1.1 The product furnished shall conform to the requirements of Table 2 for the Copper UNS No. designation and temper specified in the ordering information when determined in accordance with Test Method B 193.

10.1.1.1 Products produced in temper O60 from Copper Alloy UNS No. C19400 are not required to conform with the resistivity requirement of Table 2.

## 11. Mechanical Property Requirements

### 11.1 *Tensile Requirements:*

11.1.1 The product furnished shall conform to the requirements prescribed in Table 3 for the Copper Alloy UNS No. designation and temper specified in the ordering information when subjected to test in accordance with Test Methods E 8.

11.1.1.1 Refer to Table X1.1, Appendix X1 for SI equivalents for tensile strength.

11.2 *Rockwell Hardness*—The approximate Rockwell values given in Table 3 are for general information and assistance in testing and shall not be used as a basis for rejection.

NOTE 4—The Rockwell hardness test offers a quick and convenient method of checking for general conformity to the specification requirements for temper and tensile strength.

TABLE 1 Chemical Requirements

Element	Composition, %					
	Copper Alloy UNS No.					
	C19200	C19210	C19400	C19500	C19700	C19720
Copper	98.5 min	remainder	97.0 min	96.0 min	remainder	remainder
Iron	0.8 to 1.2	0.05 to 0.15	2.1 to 2.6	1.0 to 2.0	0.30–1.2	0.05–0.50
Phosphorus	0.01 to 0.04	0.025 to 0.04	0.015 to 0.15	0.01 to 0.35	0.10–0.40	0.05–0.15
Zinc	0.20 max	...	0.05 to 0.20	0.20 max	0.20 max	0.20 max
Lead, max	0.03	...	0.03	0.02	0.05	0.05 max
Tin	...	...	...	0.10 to 1.0	0.20 max	0.20 max
Cobalt	...	...	...	0.3 to 1.3	0.05 max	...
Aluminum	...	...	...	0.02 max	...	...
Magnesium	...	...	...	...	0.01–0.20	0.06–0.20
Nickel, max	...	...	...	...	0.05	0.10 max
Manganese, max	...	...	...	...	0.05	0.05 max



TABLE 2 Electrical Resistivity Requirements and Equivalent Conductivity

Temper <sup>a</sup>	Copper Alloy UNS No.	Resistivity at 20°C (68°F) Ω g/m <sup>2</sup>	Equivalent Conductivity at 20°C (68°F), % IACS
O50, O60 <sup>A</sup> , O61, and O62	C19200	0.235 81 max	65 min
	C19210	0.170 31 max	90 min
	C19400	0.383 26 – 0.204 37	40 – 75
	C19500	0.305 65 max	50 min
	C19700	0.191 60 max	80 min
H01, H02, H03, H04, H06, H08, H10, and H14	C19200	0.255 47 max	60 min
	C19210	0.180 33 max	85 min
	C19400	0.255 47 max	60 min
	C19500	0.340 62 max	45 min
	C19700	0.199 06 max	77 min
	C19720	0.199 06 max	77 min

<sup>A</sup> O60 temper of Copper Alloy UNS No. C19400 is not required to conform with the resistivity requirement of this table.

## 12. Purchases for U.S. Government Agencies

12.1 When identified in the contract or purchase order, as product purchased for agencies of the U.S. Government, it shall conform to the special government requirements stipulated in the Supplemental Requirements given in Specification B 248.

## 13. Dimensions, Mass, and Permissible Variations

13.1 The product furnished under this specification shall conform to the following tables in the Dimensions, Mass, and Permissible Variations section of Specification B 248:

### 13.1.1 Thickness:

#### 13.1.1.1 Tolerances—Table 1.

### 13.1.2 Width:

#### 13.1.2.1 Tolerances for Slit Metal and Slit Metal with Rolled Edges—Table 2.

#### 13.1.2.2 Tolerances for Square-Sheared Metal—Table 5.

#### 13.1.2.3 Tolerances for Sawed Metal—Table 6.

### 13.1.3 Length:

#### 13.1.3.1 Tolerances for Straight Lengths—Table 7.

#### 13.1.3.2 Schedule of Minimum Lengths with Ends—Table 8.

#### 13.1.3.3 Tolerances for Squared Sheared Metal—Table 9.

#### 13.1.3.4 Tolerances for Sawed Metal—Table 10.

### 13.1.4 Straightness:

#### 13.1.4.1 Tolerance for Slit Metal or Slit Metal Either Straightened or Edge Rolled—Table 11.

#### 13.1.4.2 Tolerances for Squared Sheared Metal—Table 12.

#### 13.1.4.3 Tolerances for Sawed Metal—Table 13.

### 13.1.5 Edges:

#### 13.1.5.1 Tolerances for Radius of Square Edges—Table 14.

#### 13.1.5.2 Tolerances for Radius of Round Corners—Table 15.

#### 13.1.5.3 Tolerances for Radius of Round Edges—Table 16.

#### 13.1.5.4 Tolerances for Radius of Full Rounded Edges—Table 17.

## 14. Test Methods

### 14.1 Chemical Analysis:

14.1.1 Chemical composition shall be determined, in case of disagreement, by the following appropriate method:

Element	Test Method
Aluminum	E 478
Copper	E 478
Cobalt	E 75
Iron	E 76
Lead	E 478 (AA)
Manganese	E 62
Nickel	E 478 (Photometric)
Phosphorus	E 62
Tin	E 478 (Photometric)
Zinc	E 478 (AA)

14.1.1.1 Since no recognized test method is known to be published, the determination of magnesium shall be subject to agreement between the manufacturer or supplier and the purchaser.

14.1.2 Test method(s) used for the determination of element(s) required by contractual or purchase order agreement shall be as agreed upon between the manufacture and the purchaser.

14.2 Test methods for all other properties are given in Specification B 248.

## 15. Keywords

15.1 copper-iron alloy plate; copper-iron alloy rolled bar; copper-iron alloy sheet; copper-iron alloy strip; UNS No. C19200; UNS No. C19210; UNS No. C19400; UNS No. C19500; UNS No. C19700; UNS No. C19720

**TABLE 3 Mechanical Requirements**

Temper Designation (B 601)		Tensile Strength, ksi <sup>A</sup>	Approximate Rockwell Hardness			
Designation	Name		B Scale		Superficial 30T	
			0.020 in. (0.508 mm) to 0.036 in. (0.914 mm) Incl	Over 0.036 in. (0.914 mm)	0.012 in. (0.305 mm) to 0.028 in. (0.711 mm) Incl	Over 0.028 in. (0.711 mm)
Copper Alloy UNS No. C19200						
O61	annealed	40–50	...	...	...	...
H01	¼ hard	45–55	...	...	...	...
H02	½ hard	52–62	53–69	...	53–66	...
H04	hard	60–70	68–74	...	66–71	...
H06	extra hard	67–74	71–75	...	69–73	...
H08	spring	70–78	73–76	...	69–74	...
H10	extra spring	74–80	73–76	...	69–74	...
Copper Alloy UNS No. C19210						
O61	annealed	27–42	...	...	...	...
H01	¼ hard	43–53	...	...	...	50 max
H02	½ hard	47–60	...	...	...	35–60
H03	¾ hard	52–62	...	...	...	52–67
H04	hard	56–66	...	...	...	54–69
H06	extra hard	60–70	...	...	...	56–71
H08	spring	64–74	...	...	...	58–73
H10	extra spring	66 min	...	...	...	60–75
Copper Alloy UNS No. C19400						
O60	soft anneal	40–50	...	...	...	...
O50	light anneal	45–55	...	...	...	...
O82	annealed to tem- per—½ hard	53–63	...	...	...	...
H02	½ hard	53–63	49–69	57–70	52–63	51–66
H04	hard	60–70	67–73	68–76	61–68	64–69
H06	extra hard	67–73	72–75	75–77	67–69	68–69
H08	spring	70–76	73–78	76–79	68–69	69–72
H10	extra spring	73–80	75–79	77–80	69–70	69–72
H14	super spring	80 min	...	...	70 min	...
Copper Alloy UNS No. 19500						
O60	soft anneal	50–60	...	...	...	...
H01	¼ hard	60–72	63–79	...	61–71	...
H02	½ hard	68–78	76–81	...	69–73	...
H03	¾ hard	75–85	80–83	...	72–74	...
H04	hard	82–90	82–85	...	73–75	...
H08	spring	88–97	84–87	...	74–77	...
Copper Alloy UNS No. C19700						
O60	soft anneal	43–53	...	...	...	...
H02	½ hard	53–63	62–71	...	62–68	...
H04	hard	60–70	66–73	...	65–70	...
H06	extra hard	67–73	70–75	...	68–71	...
H08	spring	70–76	71–77	...	69–72	...
H10	extra spring	73–80	72–78	...	70–74	...
Copper Alloy UNS No. C19720						
HR02	½ hard	56–63	65–71	...	62–68	...
HR04	hard	60–70	66–73	...	65–70	...

<sup>A</sup> The tensile strength conversions to SI units are given in Table X1.1 (ksi = 1000 psi).



## APPENDIX

## (Nonmandatory Information)

## X1. METRIC EQUIVALENTS

X1.1 The SI unit for strength properties now shown is in accordance with the International System of Units (SI). The derived SI unit for force is the newton (N), which is defined as that force which when applied to a body having a mass of one kilogram gives it an acceleration of one metre per second squared ( $N = \text{kg} \cdot \text{m/s}^2$ ). The derived SI unit for pressure or stress is the newton per square metre ( $\text{N/m}^2$ ), which has been named the pascal (Pa) by the General Conference on Weights and Measures. Since  $1 \text{ ksi} = 6\,894\,757 \text{ Pa}$ , the metric equivalents are expressed as megapascal (MPa), which is the same as  $\text{MN/m}^2$  and  $\text{N/mm}^2$ .

TABLE X1.1 SI Equivalents for Tensile Strength

ksi	MPa
40	275
43	295
45	310
47	325
50	345
52	360
53	365
55	380
57	395
60	415
62	425
63	435
67	460
70	485
73	505
74	510
76	525
80	550

## SUMMARY OF CHANGES

Committee B05 has identified the location of selected changes to this standard since the last issue (B 465 – 03) that may impact the use of this standard. (Approved May 1, 2004.)

- (1) Added Alloy C19720 to the Scope, to paragraph 6.1.1, and to Keywords.  
(2) Added tempers to paragraph 8.1.

- (3) Added chemistry of Alloy C19720.  
(4) Added electrical resistivity to Table 2 and mechanical properties to Table 3 for Alloy C19720.

Committee B05 has identified the location of selected changes to this standard since the last issue (B 465 – 00<sup>e1</sup>) that may impact the use of this standard. (Approved Oct. 1, 2003.)

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|---|---|
| <ul style="list-style-type: none"><li>(1) Added Copper Alloy UNS No. C19210 to 1.1.</li><li>(2) Switched order of Sections 3 and 4 (General Requirements and Terminology).</li><li>(3) Added Copper Alloy UNS No. C19210 to 6.1.1.</li><li>(4) Added reference to Appendix X1 in 11.1.1.1.</li><li>(5) Added alloy numbers to Section 15.</li><li>(6) Added Copper Alloy UNS No. C19210 to Table 1.</li><li>(7) Revised Table 2 to include Copper Alloy UNS No. C19210;</li></ul> | <ul style="list-style-type: none"><li>reformatted to include conductivity equivalents; removed rolled and rewound temper designations.</li><li>(8) Added mechanical requirements for Copper Alloy UNS No. C19210 to Table 3.</li><li>(9) Moved former Table 4 to be Table X1.1 in the Appendix.</li><li>(10) Removed Section X2, Conductivity Equivalents (including Table X2.1).</li></ul> |
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